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Adaptive Design Service Project

Manual for Project Replication

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The Massachusetts Department of Education, through the Bureau of Institutional Schools (BIS), provides a wide range of services to the special needs, physically handicapped student. One of the most recent, and promising, additions to these services is the Adaptive Design Services Project. This project has been developing over the past several years and, in two years of operation in the community, has proven to be desirable, beneficial and workable.

The referral of students to Adaptive Design has been, quite literally, overwhelming. Still, there are hundreds of handicapped students that we need to reach. The Bureau is initiating a solution by encouraging and offering assistance to others who are interested in replicating the Adaptive Design Services Project, in response to a high demand and need.

This Program Manual is a small step in helping to develop similar adaptive equipment programs. The initiative of others who are committed to this type of project can be facilitated by the Adaptive Design staff via consultation and training.

I encourage your comments, questions, and ideas in regard to this Manual and about implementing your program.

Sincerely,

Marvin A. Moore

Marvin A. Moore, Director
Bureau of Institutional Schools

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INTRODUCTION

Individuals with physical handicaps often rely on equipment, called assistive aids, to help them do various tasks, such as going from one place to another, communicating with others or performing self-care skills. There are many assistive aids on the commercial market, but a significant percentage of the handicapped population cannot use them without customized adaptation. The Adaptive Design program arose both from a recognition of this need and from the experience that the Bureau of Institutional Schools had already gained in adapting educational aids.

Adaptive Design bridges the gap between commercially available aids and what individuals with physical handicaps need to use them effectively. We modify part or all of the environment so that people with special needs can participate in the activities of that environment. Adaptive Design's focus is within the educational system, but many of the concepts we use can be more generally applied.

The staff of Adaptive Design is eager to attract and utilize the knowledge and skills from other disciplines. We seek to explore all avenues and applications of human factors engineering, whose principles specifically address functioning within the human environment. It is easily shown that many of the barriers that students with disabilities face in the school environment are the same barriers they will face in their workplace, and even at home.

This manual reflects not only the objective information and practical experience gained by the Adaptive Design staff in the course of providing services, but also the value of the system itself. The philosophy of "whether we regard a person who is handicapped as essentially like other people despite the handicap" is of considerable significance, not only to the staff of Adaptive Design, but also to those whose position and tireless work continue to provide motivation and good ideals.

What we do is not new. We often apply techniques that have been used in other circumstances (for instance, did you know that 'Velcro' was developed for the NASA space program?). But, what we can do is help you to apply these skills so that you, too, can make work, study or life in general, easier and better for all people with disabilities.

This manual is published in the true hope that it will sustain a dedication to things that will make a real difference to physically handicapped people and the environments in which they function. We must work together to "make it better."

A HISTORY OF THE ADAPTIVE DESIGN PROGRAM

1. Background

Adaptation of devices for students is a service that has been provided for a number of years, typically by therapists, teachers and parents. These first attempts met with varying success, but proved a point: relatively simple modifications can be constructed which will greatly enhance the student's ability to participate more fully in their educational process. The Bureau of Institutional Schools, recognizing this, began planning a program that would provide all special needs teachers and therapists, not just those who have access to 'handy' or creative individuals, with a mechanism for pursuing their ideas.

The Bureau's first program was started at the Paul A. Dever State School, in Taunton, in 1978 with funds allocated to an educational collaborative serving the school-aged Dever residents. Three individuals, working out of a small garage located on site, provided mostly seating and positioning aids to 55 students there. Other services included fabrication of wheelchair trays, custom switches and educational enhancement devices.

In the early months of 1981 the Department of Mental Health, having recognized that these services would also benefit their service population, provided monies to the Dever State School to expand upon the Bureau's program. The workshop soon moved out of the garage and into the School's 'Prep Shop', a much larger facility. The Bureau maintained adaptive equipment staff there until early in 1986, when that staff moved to another site. By that time the Bureau had already begun another program, one which would also serve other BIS students and special needs students in the community.

A part of the impetus for this newer program came as a result of the expertise and knowledge that BIS gained through its involvement with adaptive equipment at the Paul A. Dever State School. Another motivation was a growing awareness that the adaptive equipment needs of other handicapped students being served by the Bureau could be met by such a program.

Through Massachusetts' State grant monies, the Bureau began, in June of 1984, to staff their innovative program. Housed at the Lakeville Hospital Rehabilitation Center, in Lakeville, Massachusetts, a staff of three organized and equipped the Adaptive Design workshop in preparation for its service delivery function.

The Adaptive Design program began operations in September of 1984. Its original purpose was to provide services for the BIS population of the Southeast District of Massachusetts. The student population consisted mainly of students residing at the Lakeville Hospital Rehabilitation Center and Paul A. Dever State School.

Also during the fall of 1984, additional staff were hired through a one-year Federal grant to provide services to students in the public schools (Local Educational Agencies or LEA's) within the Southeast District. In the fall of 1985, Adaptive Design opened its services to all LEA's throughout Massachusetts. Since that time, and to this writing, Adaptive Design has provided services to over 220 special needs students from nearly 100 different LEA's. Currently, all staff positions at Adaptive Design are funded through negotiated contracts with collaboratives using State (BIS) monies.

2. Services provided

The projects (adaptation, modification or fabrication of assistive devices) that Adaptive Design has provided address a wide range of student needs. Referrals for seating and positioning, representing the bulk of referrals, are typically made by occupational and physical therapists who are working with the student. Teachers, recognizing barriers their students face in accessing educational equipment, generate referrals for modifications of the equipment or fabrication of "add ons", such as keyboard guards for computers and typewriters, and custom switches which permit students access to educational software or other purposes. Most have been unique, one-of-a-kind modifications, although several of the projects have proven beneficial to more than one student.

3. Internal development

Adaptive Design has undergone several organizational changes over the past two years. First, being located on-site at a Department of Public Health facility has required that the staff also be accountable to the hospital administration. Once "in the system" for a while, the staff learned that certain rules and regulations, which were not common knowledge, limited certain activities the staff had taken for granted. Most frequently these were discovered only after "the law" was broken. These experiences brought about a realization that it is best to have one person on staff who acts as liaison to the hospital's administration.

At the same time (again because of ADS's particular situation of serving students who reside and receive educational services within a hospital), learning how to integrate the program's services with this hospital's staff became a trial and error process. This is particularly true of wheelchair positioning inserts, since there is often a need to instruct nursing and other direct-care staff on how to manipulate the various components. Adaptive Design quickly learned to use the staff occupational therapist to provide this training and act as trouble-shooter.

In the early stages of the program, with only three staff serving a small population, the responsibilities of daily functioning were minimal. As the program's purview (scope and capacity) and staff grew it became increasingly necessary to define roles and areas of responsibility. Distributing various programmatic responsibilities among several of the workshop staff, thereby instituting a hierarchy of supervision, was the first step. One position, the Production Supervisor, was established to oversee day to day functioning (assignment of projects to designers and materials inventory). A staff designer was appointed Operations Manager to coordinate ongoing program development and act as liaison between the

Adaptive Design staff and Bureau management. This individual's responsibilities also include enforcing in-house policy and procedures.

One future goal of Adaptive Design is to increase the availability of these services by replicating the program at other locations in Massachusetts. The staff is prepared to consult with other programs who are interested in providing the services and to provide staff training. The Adaptive Design program will also continue with its service delivery function, although at a reduced level.

PHILOSOPHY OF THE ADAPTIVE DESIGN PROGRAM

We perhaps take for granted objects in daily life which have been designed, or adapted, specifically for a group of individuals who are not part of the "normal" population. Common, everyday devices designed especially as assistive aids include automatic door openers (used at supermarkets and malls as well as hospitals and nursing homes), reach extenders (used by stock clerks in grocery and automotive stores as well as being an indispensable aid to many full-time wheelchair users), and, of course, eyeglasses (which permit 'visually impaired' individuals to see well enough to read, drive, and perform other tasks which would otherwise be difficult or would require re-learning). These are useful examples of public demand for devices functionally suited to a group's needs and abilities.

A "handicap" becomes manifest only when an individual is faced with a challenge that is physically difficult to perform. Experience has shown that, once this barrier is recognized, appropriate intervention by the adaptive services professional can significantly reduce the handicap or eliminate it altogether. This is, then, an appropriate normalization strategy for a large segment of the special needs population.

The sole intention of Adaptive Design is to improve the quality of life for the handicapped student, especially as it relates to education. It is the belief of the staff of Adaptive Design, as well as those whose foresight has established this program, that all students should be given equal opportunity to pursue an education, in particular, and, in general, to participate in society to the best of their ability. The foundation of this belief is a recognition that their basic needs as people are identical with those of their peers living in the general society. It is only in relation to those common human needs that meaningful, specialized services can be provided to compensate for the disabilities that accompany their distinctive handicap.

We also believe that our time and expertise are too valuable to spend in "re-inventing the wheel." To that end, we must work closely with the commercial market, but only to the extent that it can help us to attain our goals. Adaptive services programs can remain abreast of new and existing equipment, devices and aids by maintaining good working relationships with a large number of commercial vendors. Drawing on this experience, the staff will become knowledgeable and objective specialists who can discern quickly which avenue to take in addressing the many needs they are faced with each day.

Adaptive Design recognizes that a special commitment is necessary in order to remain effective and that misplaced compassion (pity, feeling sorry for the student and his "plight") can easily become a hindrance to services. There is a need to eliminate these persistent, emotional reactions and negative stereotypes because they will continue to restrict the opportunities open to some groups. Adaptive Design, by demonstrating the benefits of customized assistive aids, is helping to educate the public at large and to re-orient their attitudes.

It is a recognized fact that the provision of educational services relies upon the expertise of specialized disciplines, which, for this population, includes the Special Needs teacher and speech, physical and occupational therapists. As an adjunct to these services, Adaptive Design believes that the use of a "democratic" process is necessary to achieve a proper balance of the needs expressed by a majority of disciplines and individuals involved with the student. Therefore, input from the student and all parties concerned must be solicited and seriously considered. The goal is not merely finding any solution. It is to determine the one, or ones, which will maximize the student's own functional independence within the educational setting and, at the same time, not inhibit the efforts of the multidisciplinary educational team.

Our motivation is partly derived from the pride and satisfaction we receive in helping each individual and program that comes to us and the challenges of finding solutions to unique problems. The students themselves also provide other motivating and inspiring forces that make working in this field rewarding. Working together, we know that the physical and emotional obstacles to fully integrating the handicapped into the mainstream of society can, and will, be overcome.

JUSTIFICATION FOR REPLICATION OF
THE ADAPTIVE DESIGN SERVICES PROJECT

I. Introduction

Adaptive Design is providing an invaluable service to the public by improving the accessibility to educational programs for the special needs population. This population is large, with several thousand students scattered throughout the state. The fact that the Bureau of Institutional School's Adaptive Design Workshop at Lakeville Hospital has a backlog of referrals (at this writing: 97) representing a waiting period of approximately 12 months, underscores the demand for such services. More than 80% of these referrals are from the Southeast District of the Massachusetts Department of Education, as acting on referrals from other parts of the state is somewhat difficult. This will be discussed in part II of this section.

The necessity for and benefits to be accrued by adaptation of educational equipment (and, for that matter, a great deal of devices and equipment in general) is well documented and understood. We perhaps take for granted objects in daily life which have been designed, or adapted, specifically for a group of individuals who are not part of the "normal" population. The plethora of common, everyday devices designed especially as assistive aids include automatic door openers (used at supermarkets and malls as well as hospitals and nursing homes), push button telephones (designed to speed the dialing process as well as provide the physically handicapped with an alternative to the rotary dial telephone), reach extenders (used by stock clerks in grocery and automotive stores as well as being an indispensable aid to many full-time wheelchair users), and, of course, eyeglasses (which permit 'visually impaired' individuals to see well enough to read, drive, and perform other tasks which would otherwise be either difficult or would require re-learning). These can all be considered as examples of a public demand for devices functionally suited to a group's needs and abilities.

The video-documentary on this program, entitled "Adaptive Design: Making it Better," provides concrete evidence of actual benefits which students (our service population) have derived from intervention by the Adaptive Design staff. One collaborative therapist states: "...a properly fitted and adjusted wheelchair for (student's name) is not available commercially, but Adaptive Design can make it right for his needs...He had never had independent mobility before... but he seemed to know exactly what to do when he sat in the adapted wheelchair...and is now functionally mobile." Another therapist, referring to a different student, says: "Before, (student's name) was unhappy and uncomfortable. Just look at him now! He is able to participate in classroom activity, and that makes him very happy." Both therapists also agreed that, "without Adaptive Design, we don't know what we would do."

We can also point to the many occasions where, because of our adaptive services, barriers which had prevented student access to classroom equipment and educational programming have been eliminated. These examples include the fabrication of keyboard guards for computers and typewriters and specially designed desks and classroom fixtures. Other adaptations, such as alternative positioning inserts, add-on devices, and electronic modifications and interfacing, have increased available recreational and/or proprioceptive opportunities. (Proprioception is appropriate and beneficial stimulation of body sensors which tell the brain where a body part is in space.)

II. The Need for Replication

It was mentioned earlier that most referrals to the Adaptive Design program have come from schools within the Southeast District, although the services are available to all L.E.A.'s in Massachusetts. First-time referrals coming from school programs outside the District are usually accompanied by a request to bring our expertise to the sites where special needs students are receiving their educational programs. Upon learning that we cannot honor this request, many of these referrals are withdrawn because of the time and expense commitments associated with travelling to the Lakeville site.

The "mobile workshop" idea has been envisioned by some adaptive services programs as a potential solution to meeting the needs of those individuals who are unwilling to make travel arrangements in order to receive services. Although the mobile concept is plausible and has certain merit, it is potentially both inefficient and somewhat idealistic. This mode of operation could make the provision of services extremely slow, thereby greatly reducing the number of individuals who could be served per year. The existing arrangement has allowed Adaptive Design to provide nearly 220 students with over 400 separate adaptations in only two years of operations. Given that the time to complete a project varies with the type of referral, from two days (for a modification of a keyboard) to nearly six weeks (for a wheelchair adaptation), one could easily see how certain programs (especially provision of customized positioning systems) could, under a 'travelling' arrangement, consume enormous amounts of time and expense. Other, less obvious costs, must also be considered, such as the cost for electrical power to run the equipment and repair and maintenance of the vehicle. Equipping the mobile shop for every contingency might also be an insurmountable task.

The mobile shop method could also be very taxing on staff, as they may be spending inordinate amounts of time (and, therefore, expense) on the road. Also, personality issues, such as the ability to remain motivated, coping with traffic and weather conditions, and balancing family responsibilities, are very real concerns.

A better answer is to replicate the program at various sites throughout the state, at locations convenient to large segments of the population. The techniques and technology used by the staff of Adaptive Design at Lakeville can indeed be utilized by others.

It is the purpose of this Program Manual to provide a basis for establishing your own adaptive services facility. The Bureau's Adaptive Design program is ready and willing to provide training and consultation to both direct-design and managerial staff in order to assist in furthering your pursuits.

STEPS IN ESTABLISHING THE FACILITY FOR DESIGN AND FABRICATION OF ADAPTIVE EQUIPMENT

Several steps are necessary prior to initiating services. In presenting these, some flexibility has been written in so that a program can be reflective of your particular needs, circumstances and ideas. The discussion which follows is provided as a rough outline which presents both hard-and-fast ′givens′ as well as areas where you can ′fill in the blanks′ with your own particular style.

Prior to actual service provision you must, of course, have a facility to house the program. The size of the facility and the equipment contained within it depend, to some degree, upon the characteristics of the population you will be serving. Equipping the facility may also vary with the caliber of staff who are to provide services. Organizationally, you will need to develop forms to coordinate the service provision processes: referrals and notification, fittings, fabrication, and (if applicable) reimbursement procedures. (See Appendix for examples of these forms.)

The following pages discuss the two most fundamental considerations which must be addressed prior to actual service provision. These are a determination of the services which are to be provided, which can be relative to the population to be served, and a discussion of the workshop itself, in terms of space requirements, layout, equipment, and the like. An earnest attempt is made in the "Facility" section to provide the reader with the benefit of our experience in making maximum utilization of a small workshop space. The discussion provided is a culmination of over two years of repeated workshop design, functional analysis and re-design. Each time, dramatic improvements in space utilization have been made. It is recommended that such a process be followed and there be a recognition that the workshop must evolve to reflect the program′s capabilities.

I. Characteristics of the Population Being Served

The most important step to take prior to planning the actual facility is to determine the population that will be served and to decide upon what types of services will be provided. Optimally, a ratio of services by category should be determined, but this may only be possible after the facility has been providing services for some time, when a feel for consumer demand has been ascertained.

Categories of adaptive services may include:

- positioning (inserts which provide support of the body within the wheelchair, seating at a workstation, etc.);
- user devices (modification of equipment, fabrication of specialized devices, etc.);
- environmental modification (applications of ergonomics); and,
- repair or maintenance.

Most requests for adaptations will fall within one of the above categories, with 'user devices' being somewhat of a catchall category.

For a given disability population, design solutions are not entirely unique, since, when comparing populations, substantial overlaps in design approach can be found. On the other hand, useful design criteria (leading to quasi-standardization of inventory and supply needs) can be extracted from careful observation of user population, such as in a comparison of functional abilities or the extent of trunk support required. A comparison between individuals with spinal cord injuries and those with neuromuscular disorders (cerebral palsy, muscular dystrophy, etc.) would show, for example, that individuals with muscular dystrophy will require more extensive wheelchair positioning support mechanisms than would most individuals with a spinal cord injury.

Inventory needs, then, are somewhat dependent upon the types of services which are to be provided. Insofar as wheelchair seating and body support systems are concerned, the materials are generally 'cut and dry'. Other services, such as electronic interfacing, will require the availability of a totally different range of supplies.

Other important reasons to first analyze your consumer population might include their availability for the scheduling of fittings and for reimbursement considerations. Consumers and fitting participants who are nearby will expedite service provision more than those who must travel great distances. Funding requirements vary greatly between and amongst second and third party payers, perhaps necessitating multiple cash-flow strategies.

II. The Design and Fabrication Facility

Contained within this Program Manual is a diagram which is an approximation of the floor plan of the BIS workshop in Lakeville. The discussion which follows is both a guide to maximization of a given space and an introduction to the dynamics of such a design facility.

The fittings area is the hub of the facility. It must be sufficient to comfortably contain and shield the consumer and all fitting participants from the activity which goes on within the fabrication areas of the workshop. Depending upon the handling capacity of the facility, the fittings area may only be used periodically. It could, then, to some degree, provide an overlap of functions. The office and/or upholstery functions might also be done in the same area in a workshop which employs three, or less, direct-design staff. It is wise not to use the fittings area for functions other than those discussed above because of concerns arising from cleanliness (use of power tools creates dust, etc.) and the use of time (it may be necessary for other workers to remain idle during fittings).

The area designated as workstations is the space devoted for staff to do their research, design, and fabrication functions. We have found it unnecessary to provide additional desk space for the designers to draw up their solutions by providing adjustable height workstools which permit use of the workbench for both standing and sitting tasks. A folding drafting table is available in the office for those occasions when detailed drawings are needed.

The layout of the workstations should follow sound ergonomic principles (efficient design of human workspace) involving: available tabletop area needs, worker's reach, working heights, lighting, access to equipment and supplies, and propinquity of co-workers. In providing the workbenches (we designed and made our own; sketches and details are included), additional storage space was incorporated beneath the bench, where small parts are kept within reach. Access to the power supply (110 volts, A.C.) is available at every station, via multiple outlet boxes (minimum of 2 outlets per box) fastened to the side of each workbench. They are located such that the cord of a powered hand tool is sufficient to perform most tasks both on and off the workbench, thereby minimizing the need for extension cords.

The upholsterer's section is also 'self-contained', such that the upholsterer has ample workbench space (also with power supply) and easy access to tools and supplies. A hook-up to the compressed air supply is nearby, where it is shared by workers in that area.

Major power tools (table saw, sanders, etc.) should be situated together, within a separate area, keeping each tool's function and the workflow in mind. Since there is a strong relation to the cutting of sheet material and the tablesaw, for example, the storage of plastics and plywood is in proximity to the saw. The drill press, on the other hand, is a tool frequently used for both the boring and shaping of materials and, as shown on the diagram, is positioned as close as possible to the fabricators. Keeping the large, power tools together also minimizes the effects of dust and debris on the actual fabrication areas. Note that the upholstery area is kept as far as possible from these tools, as dust causes havoc when it gets into the sewing machine.

The use of chemicals (paints and other finishes, adhesives, and solvents) must be kept isolated from not only workers, but from the fitting participants as well. A separate room, with an exhaust fan, is vital to the safety of all concerned. Our experiences have shown that informed selection of both chemicals and materials can minimize the risks that their use imposes. Elaborate schemes to vent and process toxic fumes can be avoided through careful research and consultation with manufacturers and suppliers.

One final area that needs to be addressed is storage. There is no way to avoid the need for ample storage space. The trick is to make use of all possibilities within the shop. As mentioned earlier, we use space beneath the workbenches for small parts storage. Every table in our workshop has additional shelves beneath them for this purpose.

The use of racks and shelving is recommended, especially for sheet materials of different thicknesses. Shelving, because of the support it provides, reduces the problems of warping and bowing that can occur with sheet materials and board lumber. Small scraps should be kept in shelved bins, as this prevents the inevitable piles from spilling to the floor.

Cabinets permit storage with the further advantages of keeping what is enclosed away from the effects of dust as well as the use of lock and key, to prevent unauthorized ‘borrowing’ of tools, parts, and other equipment. Making use of pegboard and clips to hang tools and small parts also enhances the workshop’s storage capacity. This arrangement helps to keep things organized and provides easy access, especially within the hand tool cabinet.

Floor space storage, for large items such as wheelchairs, is also necessary and mostly unavoidable. Allocation for such items must be included in your plans, unless they can be stored off-site. (The time spent in retrieving them should be considered, however.)

III. Summary

In providing adaptive services, the needs of the population served must be integrated into the design of the workspace. The foregoing discussion included a rationale for a predetermination of typical services to be provided and considerations of their attendant inventory and supply requirements as well as a brief overview of workshop layout.

With sufficient thought and planning, the adaptive services workshop space can be kept to a minimum. Staff size and categorical service provision will dictate, to a large extent, how much overlapping of functions can occur within the workshop.

It is most important to identify and ameliorate as many safety concerns as possible during the planning of the workshop. Workers are exposed to many environmental hazards, including high noise levels due to the operation of machinery and exposure to emmissions of potentially hazardous fumes and dusts resulting from the fabrication processes. Included in the listing of workshop equipment (to be found later in this Program Manual) are worker safety devices.

It is also important to remove outside influences which might affect the consumer during the fitting process. A well designed fittings area, isolated as much as possible from the sights and sounds of the workshop, is necessary to ensure consumer comfort and to promote effective service provision.

STAFFING THE ADAPTIVE DESIGN PROGRAM

I. Staff Composition and Roles

Ideally, the staff is composed of designer, occupational or physical therapist, fabricator, upholsterer, and office personnel. Depending upon the size of the program, there may need to be some overlap of functions amongst the members of the staff. A simplified discussion of their roles follows.

When a referral comes into the office, initial fittings are scheduled. A student file is then begun and necessary paperwork is gathered for inclusion into the file. Questions that come over the telephone or by mail are referred to the appropriate design staff. New information about commercially available products, which may come to the office as a result of the fitting process, is brought to the attention of the staff and then indexed in the product library. Additional appointments are scheduled and contracts, notices and letters are sent out as the need arises throughout the fitting process.

While all positioning related fittings require the attendance of the therapist, coverage by design staff can vary, depending on the type of referral. Amount of coverage for positioning related referrals will vary between designer (essentially the first fitting and then as necessary) and the fabricator (who attends nearly all fittings). In such cases, the designer translates the prescriptions of the therapist into the custom modification and troubleshoots when the fabricator runs into problems. In this fashion, the designer - fabricator sub-team is able to handle a wider range of positioning referrals in a given period of time. Most other types of referrals (modification of educational equipment such as computers, for example) do not necessarily require the therapist's time and can be handled independently by the designer.

On the basis of his discussion with and guidance from the designer, the fabricator may be required to construct a prototype or mock-up of the positioning modification. Consultation with the upholsterer is done when shapes of positioning pads are being developed, providing the upholsterer an opportunity to suggest changes in the shapes which will permit the making of coverings easier and/or more durable. A nearly final product is ultimately developed as several fittings are held with the user and community participants. Following a final evaluation period, usually two weeks, the wheelchair and positioning pieces are given over to the upholsterer, who makes the vinyl coverings while the fabricator, or designer, makes any final attachments or minor adjustments. Construction of mock-ups of non-positioning referrals are not usually necessary, but, if required, can be assembled by the fabricator.

The complexity of design for certain types of projects may require the designer's full attention, in which case the designer becomes more active in the actual fabrication process. Their level of expertise is best used, however, in design, consultation, and troubleshooting.

II. Desirable Background for Designers and Fabricators

A successful seating program depends upon a team approach. The team includes the designer, therapist, fabricator and community members who work with or are otherwise interested in the user/student.

The prescription of seating systems is within the purview of the staff therapist, whose extensive training in seating and positioning cannot be circumvented. In order to communicate effectively with the therapist, to the extent that they can more fully participate in the fitting process, it is advisable that all design staff have a familiarity with nomenclature and techniques as they apply to seating and positioning.

In providing services, the fabrication staff of an adaptive design program does a great deal of work with their hands, using various fabrication tools and techniques. The tools include stationary and portable power tools as well as hand tools (such as hammers, screwdrivers, and wrenches). Ultimately, competency in using such equipment, i.e. knowledge and experience in their use and function, is necessary for both fabricators and designers alike.

The use of fabricators saves both time and money, and, as a result, increases the program's service potential. Depending upon the nature of the project, design time can account for 10% to 50% of the time spent on a project. An experienced fabricator (one who not only knows the field well, but has a good understanding of each designer's style) can reduce overall fabrication time (i.e. the time between first fitting and completion of the project) by a factor of between 1/7th and 1/4th (15 to 25 percent) in most cases and by nearly 50% in others.

In general, the qualifications necessary for the Fabricator include the following: basic coordination for using mechanical devices; aptitude for interpreting diagrams and sketches; an ability to problem solve on a small scale, with and without direction; and a willingness to work with others, as a team.

The well-rounded Designer must be capable of providing a diverse range of services, most notably problem-solving through observation, design and fabrication. The range of projects that a Designer is requested to complete arise from such a wide variety of needs that the Designer should be able to "wear many hats". In the realm of adaptive services which are outside of seating and positioning, such as in modification of user-dependent systems (computers, recreational equipment, etc.), the Designer should be able to operate somewhat 'independent' from the therapist. In completing such tasks, the Designer must be able to employ basic engineering principles with ingenuity and creativity.

The Designer should have a college degree in an engineering or related field, although this need not be a strict prerequisite, especially if they have obtained experience in this or a similar field. It is recommended that the Designer be qualified in at least the following areas:

(continued on next page)

(Designer qualifications, continued)

- a functional knowledge of disabilities (what the various disabling conditions are, what functional limitations are imposed by them, and their prognoses);
- familiarity with commercially available equipment, devices, and aids;
- extensive experience in working with power and hand tools (including maintenance) as well as with the materials used in adaptive services;
- upholstering methods (layout techniques, use of the sewing machine); and,
- an ability to work with others.

One of the most important attributes of the Designer is creativity. An individual's ability to be creative is very difficult to assess without a demonstration of prior experience. Thinking creatively is also a difficult skill to instill, but there are ways to determine a person's aptitude for creative thinking. For example, experience has shown us that designers who concern themselves with detail tend to be more creative thinkers. We also see demonstrations of high levels of creativity in 'tinkerers'.

Of course, it may be difficult to find such specialized individuals. The selection of staff with an aptitude for learning by doing and/or the motivation to be trained in these areas is therefore recommended.

POWER EQUIPMENT AND HAND TOOLS

The listings found in the Appendices describe the equipment and tools we have found to be important and useful in providing services in the areas of positioning systems, equipment modification and fabrication of custom, non-commercially available devices. The reader should be advised that the success of a design facility which provides customized equipment can (and, perhaps, should) be dependent upon the ingenuity and creativity of its staff designers and fabricators. The workshop could be equipped with an endless array of specialized tools, but the creative fabricator learns to "make do," using a balance between versatility and need.

The listings are arranged in three categories, "Priorities" One, Two and Three. In categorizing them this way, we are guiding the reader into selecting the equipment which is most important (used most frequently) as well as to make the reader aware of other, perhaps less important, but practical, aids to the fabrication process.

A few words regarding "cheaping out" when selecting tools would be instructive. First, and most important, is that a tool with an established reputation is more reliable and, in the long run, less expensive than a budget model. In purchasing Priority One equipment especially, always go with those which have replacement guarantees (such as Craftsman and Snap-On for example). In regard to cutting implements (blades, bits, and the like), it is best to choose those which are constructed of superior metals. Such metals are more suited to the loads (the drilling of dense materials, such as stainless steels and hardwoods, for example) they receive in use. They also, for the most part, permit re-sharpening, thereby saving additional money over time. Pay close attention to the "Comments" sections in the listing for specific recommendations.

Another point to consider is to purchase what you need and to avoid as much as possible the purchase of "sets," especially with regard to the hand tools which make up the Fabricator Sets (see listing). Compare the components of sets carefully with your needs, as there is no sense in spending 'just a little more' on a set and purchasing tools for which you will limited use.

In using the listing it will become apparent that there is the potential for overlap of certain tools. These are the most frequently used hand tools which, for the most part, comprise the Fabricator Sets. We began providing individual sets when the design and fabrication staff grew beyond three members. Until that time, we used a central tool cabinet which housed hand tools which were shared among the staff. As we expanded it became more efficient to provide each additional member with their own set of 'basic' (Priority One) hand tools which they could move to their workstation each day in a small tool box.

Keep in mind that "time is money" and, within reason, it is best to use "the right tool for the right job" when going through the Priority Two tools and equipment. If you are unfamiliar with the operation and capabilities of these items, it is best to consult with someone who is. Their assistance can save a great deal of initial monies, time, and frustration.

SELECTING MATERIALS

Adaptive services are, by necessity, diverse and variable. They are diverse because the service population is comprised of a large group of students with wide ranging, and often unique, needs. The services are variable because they are relative to functional (and aesthetic) requirements which change, depending upon how each student can be interfaced with the particular assistive device.

The diversity of the services can have a significant impact on the selection of materials used in the fabrication of an adaptive device. In researching and selecting the most appropriate material, the concerns fall into two main categories: function and aesthetics. Most often these are taken into account on a case by case basis, although certain 'standards' can be, and are, established for specific interfacings. One example is the frequent choice of ABS plastic (tradename Kydex, for example) for keyboard guards. Another example is the use of plastics and wood in the fabrication of positioning aids.

1. Functional considerations

The first, and certainly most important category, is function. Pertinent questions that are asked include: does the material meet the minimal needs of the student, such as appropriate levels of support (as prescribed by the therapist) and, depending on the application, comfort?; is the material safe for the user (student as well as others who will handle the completed project) and is it durable enough for this particular application?; will machining the material (cutting, drilling, etc.) impose any hazards to the workshop personnel?; will this material satisfy the functional criteria of the referral (i.e., what the modification is expected to do for the student)? Also, since the student, teacher, therapist, etc., will be relying on this adaptation to provide functional assistance, can I estimate a life expectancy for this adaptation? This latter point is essential to replication and/or repair of the adaptation, where term or continuity of programming is important.

2. Aesthetic considerations

Function should never be compromised so that an adaptation will look good. However, and with this in mind, user acceptance of a given adaptive device is often subject to how it looks to them and how it makes them look. Like it or not, this is a fact of life (and it is true of nearly all consumer products!).

Aesthetic considerations include variables such as color, shape, and relative size. The designer must take into account how the modification will blend with the environment or with other devices and equipment. In making a decision, the designer may consider material availability, cost, and machineability (how the material is to be shaped or contoured in the workshop). Also, since a material being considered for its aesthetic appeal is often 'exotic', the safety of workshop personnel during the machining process must also be considered. Certain plastics, for example, emit uncomfortable levels of non-toxic (but potentially dangerous in high levels) vapors as they are cut with a high speed blade, such as a table saw.

3. A materials selection process

The following discussion outlines the selection process. Its purpose is twofold: to highlight the major steps taken in selecting materials and to show the process in operation, using, as examples, our standardization of certain materials relative to the provision of positioning inserts and keyboard guards. It is important that the staff of the adaptive equipment program (especially designers and therapist) remain abreast of new or unfamiliar materials, as their suitability to specific projects may affect both function and user acceptance.

Two case examples follow.

Example 1: Determination for the Base of a Positioning Insert

Criteria: The insert must be as lightweight as possible and easy to remove from the wheelchair frame. In addition, it must be durable, because the insert, being removeable, is exposed to more possibilities for being damaged. The increased mobility that the adapted wheelchair gives its user means that he will spend long periods of time in the wheelchair, subjecting the insert to vibrations (e.g., while riding in the school van) and high, momentary loads.

The materials we have chosen for the provision of custom positioning inserts include polyethylene and other plastics, foams, woods, vinyl fabrics, and hardware of various kinds. The selection of these materials is the result of several factors, including past experience and consultation with other seating and positioning programs. In addition, the staff has attended, and continues to attend, wheelchair seating conferences where materials are included in the agenda.

The insert for a wheelchair is broken down into two main parts: the seat and back. Each component must be considered separately before they can be integrated into a single insert, but each part does have one thing in common, a 'base' to which the customized positioning pads are attached.

In general, the base of our positioning inserts are made of 3/8" or 1/2" plywood or polyethylene plastic. In choosing plywood, we selected Baltic Birch for three major reasons: relative cost, its good durability characteristics, and the ease with which it can be shaped. Because it is composed of multiple layers (often twice as many as regular plywood), a lesser thickness provides ample structural integrity (support over a long period of time) for most of our users.

In choosing to use polyethylene (we use high density, stress-relieved), the overriding concerns fall into two main categories:

ease of cleaning with use and its provision of "reactive" support. The plastic is much more repellent of liquids than polyurethaned plywood, which can be important where incontinence is of concern and when more frequent cleaning (as is necessary when food or other debris collect on the seating base).

The polyethylene plastic is also less rigid than the birch plywood and can absorb an amount of "shock". Shock often occurs when a sudden force is applied against a stationary or rigid object. In this case, the force is usually caused by an extensor thrust (a sudden, backward motion) by a person who has cerebral palsy. The plastic bends under the force (or, more appropriately, the 'load'), thereby reducing the impact. We call this a reactive support because of its ability to absorb some of the impact.

Example 2: A Keyboard Guard for a Computer

Criteria: The keyboard guard must cover the entire keyboard, but have holes over each key, large enough for a finger to reach in and depress the key. The users are likely to rest their hand upon the keyguard as they perform the key depression, so the keyguard must be rigid enough so as not to permit other keys to be depressed at the same time. However, the keyguard must also be close to the keys so that depressing a key requires minimal motion.

In first approaching the possible solution to this request, research into commercially available options was conducted, since there are keyboard guards already on the market. (Assume that this request was for one which was not available.) The designer reported that these are available in an acrylic (clear plastic) and an unknown plastic. Manufacturers for several of the commercial options were contacted by telephone to ask about the unknown material, which turned out to be "Kydex."

Next, the yellow pages were consulted in order to find a local supplier of plastics who had in stock (preferable) or could order

Kydex. A local supplier informed the designer that Kydex is a trade name for ABS plastic, and that he kept the ABS in stock. By obtaining further information about ABS plastics from this supplier, it was determined that the plastic could be machined in the workshop with only minor precautions necessary for worker health.

Because of the criteria listed above, ABS was chosen over acrylic for several reasons. Insofar as function is concerned, a thin keyboard guard is better, faster, and safer for the user. It is also very easy to machine, which, in this case, meant multiple drilling of holes spaced closely together. The acrylic requires a dimension nearly twice as thick as the ABS and is more difficult to drill. The acrylic also can crack with stress (bearing the weight of the user's hand) and shatter when dropped. ABS, on the other hand, is very pliable. Prices are comparable.

4. Summary

In choosing materials for specific purposes an in-depth selection process should be followed. Research into desirable material characteristics is the first step. This can be done through telephoning or writing manufacturers and local suppliers. Samples can be requested or you can ask for a sales representative to make a visit to the workshop. It may often be followed by trial and error until experience yields the desired results. In cases where function is not compromised by aesthetics, the choice of material may rest on other criteria, such as cost and relative availability.

FUNDING OPTIONS

Some of the resources listed below will provide funding strategies. Others are potential sources of funding. Many will also lead you to other sources and avenues.

A. Large Databases:

Associated Grantmakers of Massachusetts, Inc., 294 Washington Street, Suite 840, Boston, MA. telephone: (617) 426-2606. A resource library of corporations and foundations which provide funding to non-profit corporations. Extensive listings which include typical dollar amounts and types of programs funded, by corporation and foundation. Call before going, as their open hours vary.

The Information Center for Individuals with Disabilities (ICID), 20 Park Plaza, Room 330, Boston, MA 02116. telephone: (617) 727-5540 or (800) 462-5015 (Mass) voice and TDD. A non-profit organization which, together with the Massachusetts Rehabilitation Commission, publishes an informative monthly newsletter ("Together") which often contains information about funding issues and resources.

B. Books and Directories:

Handicapped Funding Directory: 1986-1987 Edition, available from Research Grant Guides, P.O. Box 10726, Marina Del Rey, CA 60295. Approx. $26.00. This is updated yearly and lists 700 or more major corporations and foundations, as well as other information about funding.

Funding Book: The Many Faces of Funding, by Anna Hoffman, avail- able from Phonic Ear Inc., 250 Camino Alto, Mill Valley, CA 94941.

Funding of Mobility Equipment: Current Issues and Strategies, by Virginia Ruggles. Available through the Muscular Dystrophy Association, 810 7th Avenue, New York, NY 10019, or contact your local chapter (look in the white pages of the telephone book).

Funding of Non-Vocal Communication Aids: Current Issues and Strategies, by Virginia Ruggles. Available through the Muscular Dystrophy Association, 810 7th Avenue, New York, NY 10019, or contact your local chapter (look in the white pages of the telephone book).

Guidelines for Seeking Funding for Communication Aids, by Donna DePape and LaVonne Krause. Available from the Trace Center, Waisman Center, University of Wisconsin, Madison, WI 53706.

C. Fee for Service Options:

1. Medicaid

- contact the: Department of Public Welfare
  Provider Enrollment Unit
  Room 755
  600 Washington Street
  Boston, MA 02111

  telephone: (617) 423-9440

- there is an application process that must be completed prior to service provision and subsequent billing

- consider also the possibility of working with an already approved vendor

2. State agencies

- depending on the requirements and restrictions of the specific agency, it may be possible to contract with them for services

- for example: Massachusetts Rehabilitation Commission
  - contact the local or central offices
  - contact the Severe Physical Disability Office

  or:

  Massachusetts Department of Public Health
  - contact Services for Handicapped Children

D. Other sources and resources:

Associations and Clubs:

American Legion

Chamber of Commerce

Easter Seal Society

Elks Club (BPOE)

Kiwanis Club

Knights of Columbus

Leukemia Society of America

Lion's Club

Loyal Order of Moose

Masons (Grand Lodge of Masons)

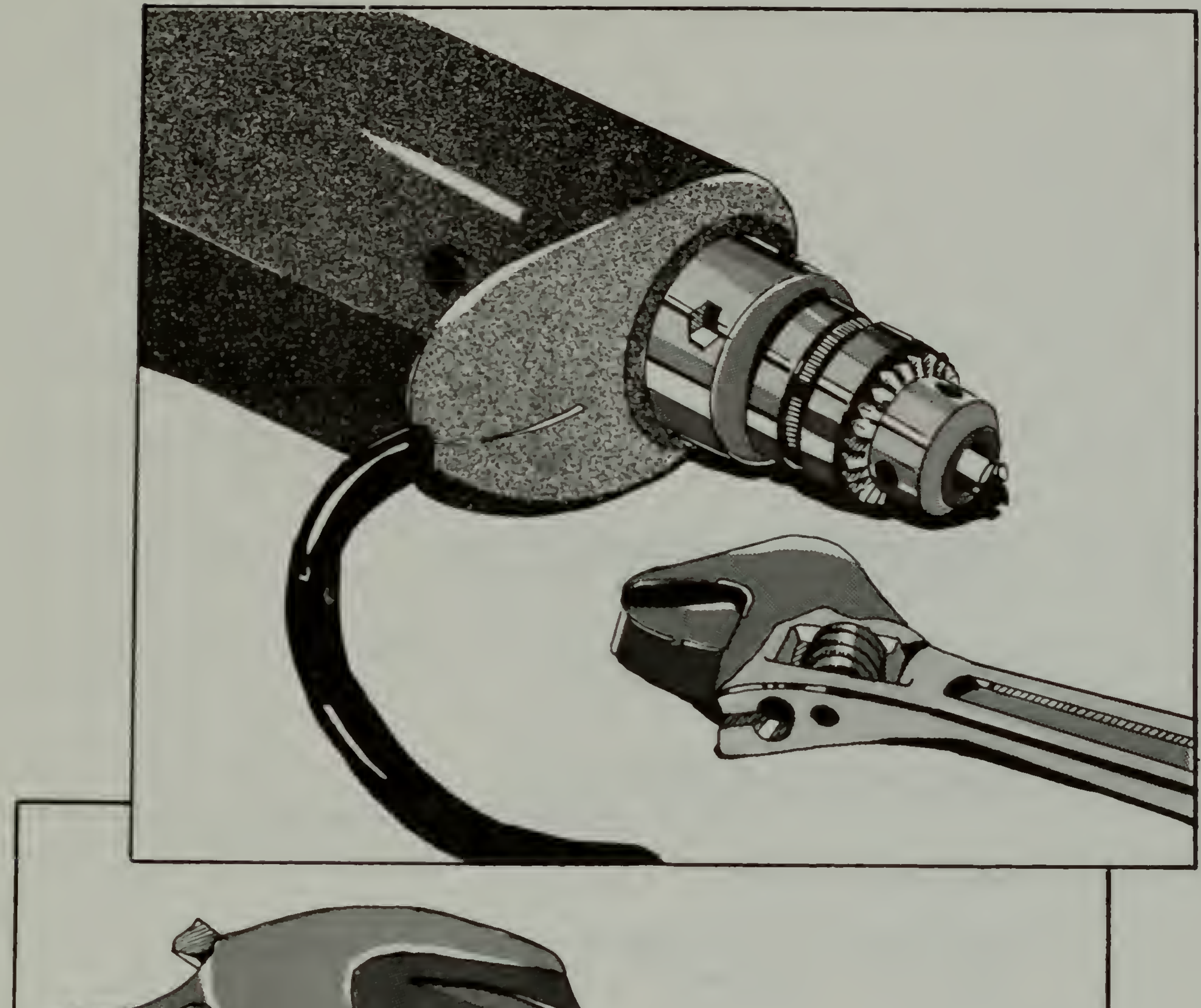
Muscular Dystrophy Association, Inc.

Social Clubs (will be listed under the name of the city, or by nationalities, such as Italian- or Polish-American)

United Way

United Cerebral Palsy

and many (literally hundreds) others.



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KEY TO FLOORPLAN OF THE BIS ADAPTIVE DESIGN WORKSHOP AT LAKEVILLE

- see following page -

SCALE: 1" approx. equal to 6′

A = Electronics parts storage and small workbench

B = Small parts and materials storage areas

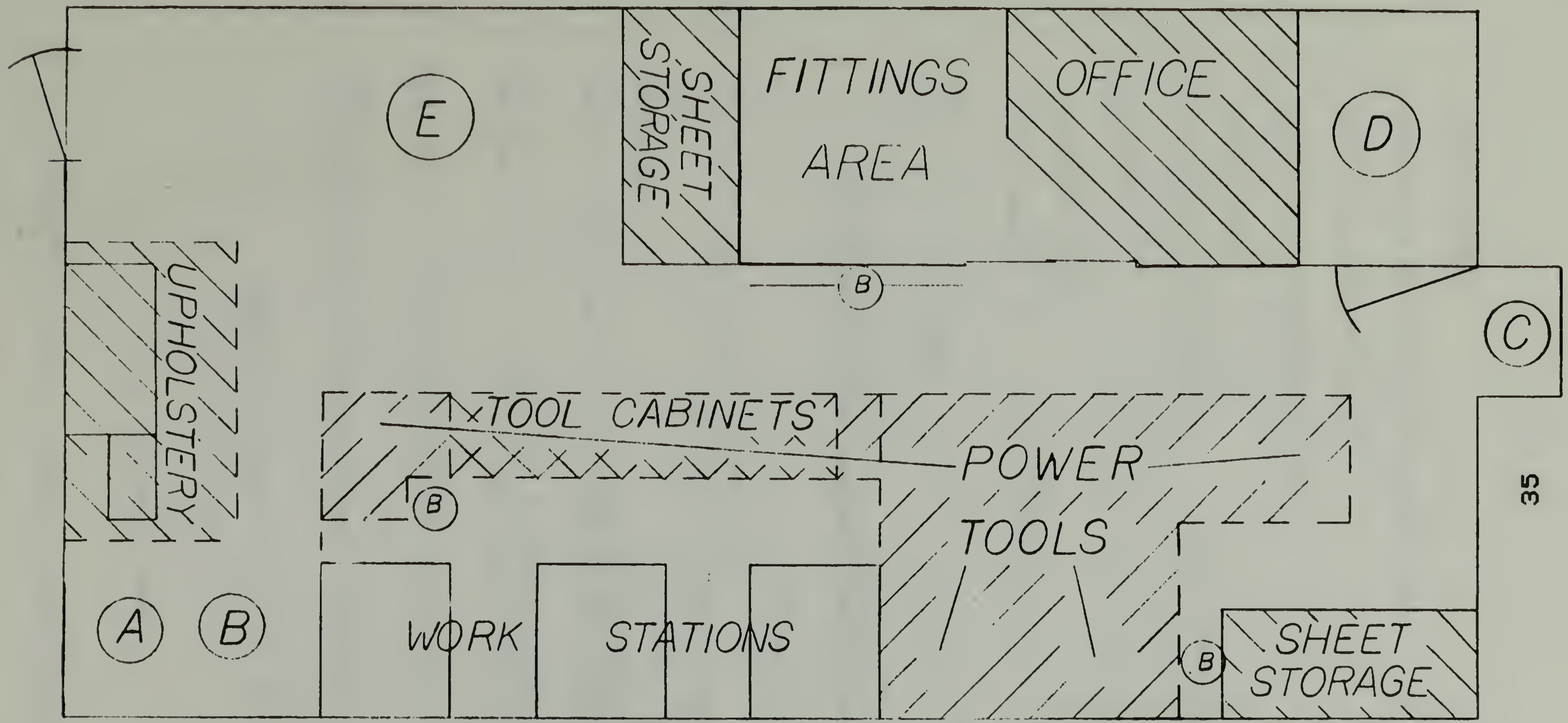
C = Sink area

D = Chemical usage room and spray booth; also location of air compressor

E = Projects and wheelchair storage area

APPROXIMATE SQUARE FOOTAGES PER DESIGNATED AREA

AREA	SQ. FOOTAGE
Total shop	1275
Fittings area	81
Office	90
Upholsterer′s workstation	99
Power tools	165
Fabrication workstations (3)	178
Spray and chemicals area	54
Wheelchair and projects storage area	72
Sheet storage	144


E
SHEET STORAGE
FITTINGS AREA
OFFICE
D
B
C
UPHOLSTERY
TOOL CABINETS
POWER TOOLS
B
A
B
WORK STATIONS
B
SHEET STORAGE

POWER EQUIPMENT, ACCESSORIES, AND UPHOLSTERY EQUIPMENT & SUPPLIES

This group of listings includes the large, stationary, power equipment necessary or useful for fabricating adapted equipment as well as the tools necessary for upholstering of wheelchairs and positioning aids. It has been arranged by "Priorities" One, Two, and Three, which is an indication of how frequently it is used or how necessary (relative to our experience) the item is.

The listing is also organized into several different categories, depending upon where and how the item is used.

See also the previous text for further information.

I. Priority One (see text for definition)

A. Stationary power equipment

Tool: Band Saw
Type: Wood
Size(s): To cut at least a 6" height
Comments: A deep throat (16" or more) would be nice, if you have the space; 1 per shop
Supplier(s): W.T. Tool, Co., industrial equipment suppliers

Tool: Belt sander
Type: 1" belt with 8" disc
Comments: Very useful; 1 per shop
Supplier(s): Sears, industrial equipment suppliers

Tool: Buffer wheel
Type: Cloth wheel
Size(s): 8"
Comments: We mounted a buffing wheel and wire wheel onto an 8" grinder motor; 1 per shop
Supplier(s): Industrial supplier, Burns

Tool: Drill Press
Type: Variable Speed
Comments: 1 per shop
Supplier(s): Industrial equipment supplier

Tool: Sander
Type: Disc sander
Size(s): 12"
Comments: Can be combined with a belt sander; 1 per shop
Supplier(s): Industrial supplier, Sears, others

Tool: Table Saw
Type: Industrial
Comments: see also accesories section
Supplier(s): Industrial equipment suppliers

B. Upholstery

1. Equipment and tools

Tool: Sewing machine
Type: Model 20-33 (example)
Comments: Excellent all-around machine; 1 per shop
Supplier(s): Sewing machine company

Tool: Scissors
Type: Knife blade and Pinking shear
Size(s): 1" to 2" blades and 6" or longer
Comments: Small for close work, long for general use
Supplier(s): Sewing store, hardware store, others

Tool: Stapling gun
Type: Pneumatic
Comments: And 1/4", 3/8", 1/2" staples
Supplier(s): Industrial equipment, Burns

Tool: Needle nose pliers
Size(s): 6" or more
Comments: For removing staples
Supplier(s): Hardware store, others

Tool: Screwdriver
Type: Slotted-type
Size(s): Small
Comments: For lifting staples to be removed
Supplier(s): Hardware store, others

Tool: Miscellaneous
Type: yard stick, fabric cutting wheel, matches or lighter
Supplier(s): Fabric and sewing stores, department store

2. Upholstery Supplies

Type: Machine needles
Size(s): #14 for vinyl and #16 for webbing
Comments: Keep plenty on hand!
Supplier(s): Fabric and sewing stores

Type: Duct tape
Size(s): 2" wide
Comments: For mock-ups and other uses
Supplier(s): Hardware store, W.T. Tool, others

Type: Vinyl covering
Comments: Fire retardant and moisture resistant
Supplier(s): Fabric store, upholstery supplier

Type: Webbing: Cotton and/or polyester
Size(s): 1", 1.5", and 2"
Comments: Get colors that coordinate with your vinyl; black & grey are generally good neutral colors
Supplier(s): Upholstery supplier, camping & recreational outlets

Type: Thread
Size(s) 4 cord
Comments: Get colors that match your vinyl
Supplier(s): Fabric and sewing stores, department store

Type: Temporary fastener (Velcro type)
Size(s): 1" and 2" widths
Comments: Buy it by the roll (50 yards) and get colors to match your webbing
Supplier(s): Louis Green, Oui-Loc

Type: Clear plastic sheeting
Size(s): 4 mil
Comments: Get it by the roll (4′ - 6′ width)
Supplier(s): Hardware store

C. Stationary workshop equipment

Fabricator′s workbench
Size(s): 6′ x 3′ x 37" and/or 5′ x 3′ x 32"
Comments: 1 per fabricator; see drawings provided
Supplier(s): Can be made in shop to save substantial capital monies

Hand tool cabinet
Comments: 1 per 6 fabricators
Supplier(s): Can be made in shop to save substantial capital monies

Chemicals cabinet
Comments: Should be fire proof; 1 per shop
Supplier(s): Safety equipment, school shop suppliers, others

D. Accessories to drill and drill press equipment

Type: Wood boring bits (′spade bit′)
Size(s): 3/8" to 1 1/2" by 8ths
Comments: Can also increment by 16ths; also consider an extension bit; 1 set per shop
Supplier(s): Widely available

Type: High speed drill bits
Size(s): 1/16" to 1/2" by 64ths
Comments: Can also increment by 32nds; get a good set that can be sharpened; 1 set per shop
Supplier(s): Widely available

Type: Expansion bit
Size(s): Up to 3" circle
Comments: 1 per shop
Supplier(s): Sears, others

Type: Countersink bit
Size(s): 3/8" to 1" by 8ths
Comments: 1 set per shop
Supplier(s): Sears, others

E. Miscellaneous tools and equipment

Air Compressor
Type: Portable
Size(s): 1 HP (minimum)
Comments: Tank pressure needs vary with hose length; most tools will require <100 psi; 1 per shop
Supplier(s): Sears, W.T. Tool Co., others

Tool: Electric knife
Size(s): 10" blade (minimum)
Comments: Useful for contouring and cutting polyfoams; 1 per shop
Supplier(s): Hardware store

Tool: Vacuum
Type: Wet and dry
Size(s): 1.1 HP (example)
Comments: The model we use is very loud, but does the job; 1 per shop
Supplier(s): Sears, others

Tool: Vise
Type: Bench vise
Size(s): 5 1/2" jaw
Comments: 1 per 4 fabricators
Supplier(s): Sears, hardware stores

II. Priority Two (see text for definition)

A. Stationary power equipment

Tool: Band Saw
Type: Metal
Size(s): 14" throat
Comments: We modified a wood saw so it would be slower for metals; 1 per shop
Supplier(s): Industrial equipment suppliers

Tool: Band saw or cutoff saw
Type: Bench mount
Comments: Very useful and a time saver; 1 per shop
Supplier(s): Industrial supplier, others

Tool: Grinder
Type: Bench mount
Size(s): 8" with 3/4 HP motor
Comments: 1 per shop
Supplier(s): W.T. Tool, Sears, others

Tool: Jointer
Size(s): 6"
Comments: This tool is useful, especially for rough and previously cut lumber; 1 per shop
Supplier(s): Industrial equipment suppliers

Tool: Sander
Type: Belt sander
Size(s): 6"
Comments: Can be combined with disc sander; 1 per shop
Supplier(s): Industrial supplier, Sears, others

B. Accessories

1. Drill and Drill Press:

Type: Forstner Bits
Size(s): 5/8", 3/4", 1"
Comments: Above sizes are minimum necessary; 1 set per shop
Supplier(s): Sears, others

Type: High speed drill bits
Size(s): #1 through #60
Comments: 1 set per shop
Supplier(s): Sears, others

Type: Drill press column clamp
Comments: Handy, and safer, for holding pieces while drilling; 1 per shop
Supplier(s): Brodhead Garrett Co., others

2. Other

Tool: Sharpener
Type: Wet stone
Comments: Good for drill bit and scissor sharpening; 1 per shop
Supplier(s): Brodhead Garrett, others

III. Priority Three (See text for definition)

A. Stationary power tool

Tool: Radial arm saw
Comments: Not as versatile as a table saw; 1 per shop
Supplier(s): Sears, others

B. Accessories

Tool: Cross and slide vise
Type: Two-way (X and Y axes)
Size(s): 4" vise with approx. 5" of travel
Comments: Can be used to simulate work from a milling machine; 1 per shop
Supplier(s): Industrial suppliers, W.T. Tool, Sears, others

Tool: Drill and Drill Press
Type: High speed drill bits
Size(s): A through Z
Comments: 1 set per shop
Supplier(s): Sears, others

Tool: Drill press
Type: Flexible shaft with chuck
Comments: 1 per shop
Supplier(s): W.T. Tool, others

Tool: Power saw fence
Example: Paralok
Comments: Very accurate and easy to use, but can be somewhat costly; 1 per shop
Supplier(s): Brodhead Garrett Co., others

HAND AND SMALL POWER TOOLS

This listing of power and hand tools is comprised of the tools we have found either useful or necessary. See previous text for further information.

First priorities: a well stocked First Aid kit and an all purpose fire extinguisher (Type A, B, and C). Available from many sources, including Lab Safety, KAR, office suppliers, etc. We have had great success with a product called "New Skin", a liquid bandage made especially for minor cuts and scrapes.

I. Designer/Fabricator hand tools and safety aids

The following list, up to General Shop Tools, are tools each designer or fabricator has within their toolbox. Notes found in 'Supplier(s)' section allude to a suggested level of tool quality. See text for further information.

Tool: Automatic Punch
Comments: 1 per fabricator
Supplier(s): Sears, others

Tool: Combination Square
Comments: 1 per fabricator
Supplier(s): Sears, others

Tool: Pliers
Type: Slip joint
Size(s): 6" to 8"
Comments: 1 per fabricator
Supplier(s): Sears, others

Tool: Pliers
Type: Groove joint (or pump)
Comments: 1 per fabricator
Supplier(s): Sears, others

Tool: Razor knife
Comments: 1 per fabricator
Supplier(s): Hardware store

Tool: Screwdriver set
Type: Phillips and Spade bits
Size(s): Get a range which includes 3 Philips and 4 spade tips
Comments: Sets of 9 pieces are available; 1 per fabricator
Supplier(s): Sears, others

Tool: Scribe
Type: Machinist
Comments: Dual point is a good all-around choice; 1 per fabricator
Supplier(s): Sears, others

Tool: Tape Ruler
Size(s): 8′ to 12′
Comments: Get the types that permit replacement of tape; 1 per fabricator
Supplier(s): Sears, others

Tool: Adjustable wrench
Type: Adjustable
Size(s): 6" to 10"
Comments: 1 per fabricator
Supplier(s): Sears, others

Tool: Allen wrenches
Size(s): 5/64" to 1/4" by 64ths
Comments: Available as a single unit; 1 per fabricator
Supplier(s): Hardware, others

Tool: Indelible Marker, such as Sharpee
Type: Colors
Comments: Red and black are preferred; 1 each per fabricator
Supplier(s): Office supply

Tool: Goniometer
Type: Clear plastic
Size(s): 6"
Comments: 1 per fabricator; mostly used during fittings
Supplier(s): Sammons

Tool: Tool Box
Size: 1 per fabricator, dependent on your needs
Supplier(s): Sears, others

Safety and worker protection equipment:

Type: Ear plugs
Comments: 1 per fabricator
Supplier(s): Lab Safety Supply, KAR, others

Type: Safety glasses
Comments: Get what the designer/fabricator is most comfortable with; 1 per fabricator
Supplier(s): Lab Safety Supply, KAR, others

Type: Respirator
Comments: 1 per fabricator
Supplier(s): Lab Safety Supply, KAR, others

II. General Shop Tools, Priority One

The following listing are tools which can be shared by all within the workshop.

Tool: Angle Finder
Type: Round, with magnetic base
Comments: 1 per shop
Supplier(s): Sears, others

Tool: Bar Clamps
Size(s): 12" and 24"
Comments: Faster and easier to use than C clamps; 2 each size per 5 fabricators
Supplier(s): Hardware store, equipment suppliers

Tool: C - Clamp
Type: Heavy Duty
Size(s): 3" to 6"
Comments: Does not require excessively deep throat; standard OK; 2 each size per shop
Supplier(s): Widely available

Tool: Caliper
Type: Vernier
Size(s): 0" to 5" range
Comments: Does not have to be precision tool; 1 per shop
Supplier(s): Sears, others

Tool: Cold Chisel
Size(s): Approx. 3/4" to 1"
Comments: 1 per 5 fabricators
Supplier(s): Sears, others

Tool: File Brush
Type: Metal bristles
Comments: 1 per shop
Supplier(s): Widely available

Tool: Framing Square
Comments: Some are made of aluminum; although lightweight, it could lose square; 1 per 3 fabricators
Supplier(s): Widely available

Tool: Hacksaw
Comments: 1 per 4 fabricators
Supplier(s): Widely available

Tool: Hand drill
Type: Variable speed, with reverse
Size(s): 3/8
Comments: 1 per 2 fabricators
Supplier(s): Sears, W.T. Tool Co., others

Tool: Hand power grinder
Type: Industrial
Size(s): 4 1/2" wheel
Comments: 1 per shop
Supplier(s): Sears, W.T. Tool Co., others

Tool: Hand jig saw
Type: Variable speed
Comments: 1 per 4 fabricators
Supplier(s): Industrial equipment suppliers, Sears, others

Tool: Heat Gun
Size(s): Dual heat settings
Comments: 1 per shop
Supplier(s): Sears, Brodhead Garrett Co., others

Tool: Hole Punch
Type: Rotary
Comments: 1 per 4 fabricators
Supplier(s): Sammons, others

Tool: Hot Glue Gun
Comments: For triwall construction and other uses; 1 per 5 fabricators
Supplier(s): Sears, others

Tool: Locking Pliers
Type: Double curve jaw
Size(s): 6" to 8"
Comments: Get several of each size; 1 each per shop
Supplier(s): Widely available

Tool: Peening Hammer
Comments: 1 per shop
Supplier(s): Sears, others

Tool: Pliers
Type: Slip Joint
Size(s): 6" to 8"
Comments: 1 per fabricator
Supplier(s): Widely available

Tool: Pliers
Type: Needle nose
Size(s): 6"
Comments: 1 per fabricator
Supplier(s): Widely available

Tool: Rivet gun
Type: Heavy duty
Comments: Although 1/8" is most frequently used, 3/16" may also be needed; 1 per shop
Supplier(s): Sears, others

Tool: Router
Comments: 1 per 5 fabricators
Supplier(s): Sears, W.T. Tool Co., others

Tool: Sander
Type: Orbital
Comments: 1 per 4 fabricators
Supplier(s): Sears, W.T. Tool Co., others

Tool: Stapling Gun
Type: Air Powered (preferable) and electric (not as useful)
Comments: Most frequently used staples: 3/8" and 1/4"; 1 per 4 fabricators.
Supplier(s): Industrial equipment suppliers

Tool: Tap and Die Set
Type: Heavy duty (high speed steel)
Size(s): Minimum: 8-32, 10-32, 1/4-20 taps and dies
Comments: Get a minimum set and add as necessary; get several #10 tap spares; 1 set per shop
Supplier(s): Sears, others

Tool: Wire Cutter
Size(s): 8"
Comments: 1 per 4
Supplier(s): Widely available

Tool: Wood Clamp
Size(s): 6" jaw
Comments: 1 pair per shop
Supplier(s): Widely available

Tool: Wood/Metal File
Type: Round, half-round, mill, flat
Size(s): 6" to 12"
Comments: Get differing grades of coarseness; 1 of each type per shop
Supplier(s): Widely available

Tool: Adjustable wrench
Size(s): 10"
Comments: 1 per shop
Supplier(s): Sears, hardware store

Tool: Wrenches Set
Type: Combination box/open
Size(s): 1" to 1 1/4", by 16ths
Comments: 1 set per shop
Supplier(s): Sears, others

Priority "Two" Tools

This listing essentially completes the lists of tools we have found useful in doing our work. See previous lists and text for further information.

I. Designer/Fabricator Hand Tools

As in the case of Priority One Tools, these three tools are typically contained in the fabricator's toolbox.

Tool: Drill set
Type: High speed
Size(s): 1/16" to 5/16" by 64ths
Comments: Set of 13 bits is available; 1 per fabricator
Supplier(s): Sears, others

Tool: Scissors
Type: Cloth/vinyl cutting
Size(s): 6" to 8"
Comments: Use appropriate "handed" scissors; 1 per fabricator
Supplier(s): Hardware, sewing store, others

Tool: Wrench set
Type: Combination open/box
Size(s): 1/4" to 1" by 32nds or 16ths
Comments: 1 per fabricator
Supplier(s): Sears, others

II. General Shop Tools, Priority Two

These tools can be shared among all workshop personnel.

Tool: 3' Metal Ruler
Comments: 1 per shop
Supplier(s): Widely available

Tool: Backsaw
Comments: 1 per shop
Supplier(s): Widely available

Tool: Bolt Cutter
Type: Multiple size/thread capability
Comments: Make sure it will cut #10-32 bolt; one per shop; 1 per shop
Supplier(s): Stanley Tools, hardware store, others

Tool: Center Finder
Size(s): Up to 6" diameter
Comments: An invaluable tool; 1 per shop
Supplier(s): Equipment suppliers, some hardware stores, but may be difficult to find
Tool: Drill Gauge
Size(s): 1/16" to 1/2" by 64ths
Comments: Can get by with less range, less accurate guide; 1 per 4 fabricators
Supplier(s): Sears, others

Tool: Handsaw
Comments: 1 per shop
Supplier(s): Widely available

Tool: Laminate (Formica, e.g.) cutter
Type: Hand tool
Comments: Saves material and makes cutting easier; 1 per shop
Supplier(s): Hardware store

Tool: Locking pliers
Type: Straight jaw
Size(s): 6" to 8"
Comments: Get several of each size; 1 each per shop
Supplier(s): Widely available

Tool: Mallet
Type: Rubber or wood head
Comments: 1 per shop
Supplier(s): Widely available

Tool: Nutdriver Set
Type: Plastic handled
Size(s): 5/16, 11/32, 3/8, 7/16
Comments: can also add: 3/16, 1/4, & 1/2; 1 set per shop
Supplier(s): Sears, others

Tool: Plastic Tipped Hammer
Type: 1 hard - 1 soft head
Comments: 1 per shop
Supplier(s): Sears, others

Tool: Metal punches
Size(s): 1/16" to 3/16" by 32nds
Comments: 1 set per shop
Supplier(s): Sears, W.T. Tool Co., others

Tool: Sliding Bevel
Comments: 1 per shop
Supplier(s): Sears, others

Tool: Wood Chisels
Size(s): .25" to 1.5" in 1/4" increments
Comments: Chrome vanadium retains sharpness, is easier to sharpen, than steel; 1 set per shop
Supplier(s): Sears, others

III. Priority Three Tools

For the most part these could be classified as unnecessary, but we have found use for them on occasion.

Tool: Block Planer
Size(s): 6"
Comments: 1 per shop
Supplier(s): Widely available

Tool: Coping saw
Size(s): Standard
Comments: For inside cuts when jig-saw not appropriate; 1 per shop
Supplier(s): Hardware store

Tool: Locking Pliers
Type: Needle nose
Size(s): 5" to 8"
Comments: Get several sizes; 1 each per shop
Supplier(s): Widely available

Tool: Metal Snips
Type: Straight cut
Size(s): 10" to 12"
Comments: 1 per shop
Supplier(s): Widely available

MISCELLANEOUS WORKSHOP SUPPLIES

The following is a listing of typical 'miscellaneous' supplies that we keep in stock. Since most of these are widely available, no effort was made to identify specific suppliers unless it was necessary. The addresses for the names that are provided can be found in the "Suppliers" listing.

ABRASIVES

Type: Sandpaper
Comments: Get 80, 100, and finer grits
Supplier(s): Hardware stores

Type: Steel wool
Comments: Get #00 for fine, grades 1 & 2 for rough
Supplier(s): Hardware stores

ADHESIVES

Type: Contact cement
Brand Name Example: Weldwood
Comments: Good for Formica, wood, styrofoam; use with caution
Supplier(s): Hardware stores

Type: Wood
Brand Name Example: Elmer's Carpenter Glue
Comments: Versatile
Supplier(s): Hardware stores

Type: Plastic
Brand Name Example: Eclectic 6000
Comments: Extremely versatile
Supplier(s): Abbeon Cal., Inc.

Type: Plastic
Brand Name Example: Craftics #33
Comments: Good for some plastics, especially ABS
Supplier(s): Brodhead Garrett Co.

Type: Spray
Brand Name Example: KAR Adhesive & Trim Cement
Comments: Bonds well where stresses are light; use with caution
Supplier(s): KAR Industrial, hardware stores

Type: Threadlock
Brand Name Example: LocTite
Comments: Use where lock washers are not appropriate
Supplier(s): Hardware stores, industrial suppliers

Type: Glue sticks
Comments: These go fast (used with triwall for mock-ups), so keep plenty in stock
Supplier(s): Hardware stores, industrial suppliers

LIQUID FINISHES

Type: Spray enamels
Comments: Keep several colors (black, blue, white) on hand; use with caution
Supplier(s): Hardware stores, industrial suppliers

Type: Spray primer
Comments: Use on plywood before enamel to seal the wood
Supplier(s): Hardware stores

Type: Wood stain
Brand Name Example: Minwax
Comments: Keep several colors on hand, especially black (instead of paint)
Supplier(s): Hardware stores

Type: Urethane
Brand Name Example: Somerville Lumber
Supplier(s): Hardware stores

TABLE SAW BLADES

Type: Combination blade
Brand Name Example: Oldham
Comments: Use blades that can be sharpened and re-set
Supplier(s): Burns, hardware stores

Type: Triple chip
Brand Name Example: Burns' special
Comments: Versatile, but use appropriately
Supplier(s): Industrial suppliers

Type: Hollow ground
Brand Name Example: Credo
Comments: Gives an excellently finished edge
Supplier(s): Industrial suppliers, hardware stores

SOLVENTS

Type: Lacquer thinner
Brand Name Example: Tru-Test
Comments: Use with caution
Supplier(s): Hardware stores

Type: Acetone
Brand Name Example: Tru-Test
Comments: Use with caution
Supplier(s): Hardware stores

MISCELLANEOUS SUPPLIES

Type: Paint brush
Comments: Get different brush widths
Supplier(s): Hardware stores

Type: Finish brush
Comments: Foam brushes are the best for urethane
Supplier(s): Hardware stores

Type: Wood putty
Supplier(s): Hardware stores

Type: Lubricant
Brand Name Example: WD - 40
Supplier(s): Hardware stores

Type: Rust penetrant
Comments: Especially useful with wheelchairs
Supplier(s): Hardware stores

Type: Pegboard and clips
Comments: Good for hanging tools
Supplier(s): Lumber and hardware stores

Type: Masking tape
Comments: Use both 1" and 2"
Supplier(s): Hardware stores

Type: Duct tape
Comments: 1001 uses!
Supplier(s): Hardware stores

OFFICE SUPPLIES

Type: Desk
Comments: With drawers
Supplier(s): Office supplier, department store

Type: File cabinet
Supplier(s): Office supplier, department store

Type: Hanging folder frame
Supplier(s): Office supplier, department store

Type: Hanging folders
Comments: With clear tabs for names
Supplier(s): Office supplier, department store

Type: Bookshelf
Comments: For catalogs, etc.
Supplier(s): Office supplier, department store

Type: Typewriter
Comments: And/or computer
Supplier(s): Office supplier, department store

Type: Stamps
Comments: For letters/packages
Supplier(s): Office supplier, department store

Type: Postal scale
Comments: Very essential
Supplier(s): Office supplier, department store

Type: Notebook paper
Comments: College and/or wide rule
Supplier(s): Office supplier, department store

Type: Typing paper
Comments: And/or printed letterhead
Supplier(s): Office supplier, department store

Type: Pens
Supplier(s): Office supplier, department store

Type: Pencils
Comments: #2 lead, with eraser
Supplier(s): Office supplier, department store

Type: Highlighter
Supplier(s): Office supplier, department store

Type: Stapler
Supplier(s): Office supplier, department store

Type: Transparent tape
Brand Name Example: Scotch
Comments: 3/4" wide
Supplier(s): Office supplier, department store

Type: Paper clips
Comments: Small, large, and extra large
Supplier(s): Office supplier, department store

Type: Scissors
Supplier(s): Office supplier, department store

Type: Message pad
Comments: For telephone calls
Supplier(s): Office supplier, department store

Type: Correction fluid
Brand Name Example: Liquid Paper
Comments: For ink and copies
Supplier(s): Office supplier, department store

Type: Clipboard
Comments: Get several; useful for fitting forms as well as shop work
Supplier(s): Office supplier, department store

Type: Manila folders
Comments: For files, papers
Supplier(s): Office supplier, department store

Type: File folder labels
Supplier(s): Office supplier, department store

Type: Envelopes
Comments: Business and 9x12 sizes
Supplier(s): Office supplier, department store

Type: Rubber bands
Supplier(s): Office supplier, department store

WORKSTATION DESIGN

(Refer to the diagram on a following page)

1. General

The workstation is essentially a durable workbench. The dimensions given below are recommended, but can be tailored to each worker's needs, which vary according to the worker's height and the types of tasks done on the workbench.

The 'Tall' bench is good for workers who are 6' or taller and who will be performing most of their work while standing. The Medium-sized bench can be used by workers who are between 5' and 6' or for taller individuals working on large projects, such as work requiring a wheelchair be placed on top of the workbench.

A workbench of approximately 24" in height is also good for large project work and is a functional height for most individuals.

2. Table of dimensions (Refer to the diagram on a following page)

	A	B	C
Tall bench	36"	72"	37"
Medium bench	32"	60"	32"
Short bench	32"	60"	24"

3. Materials

The workbench can be made with wood, wood products, and hardware (nails, screws and bolts). The following list describes the recommended materials. These take into account durability as well as cost.

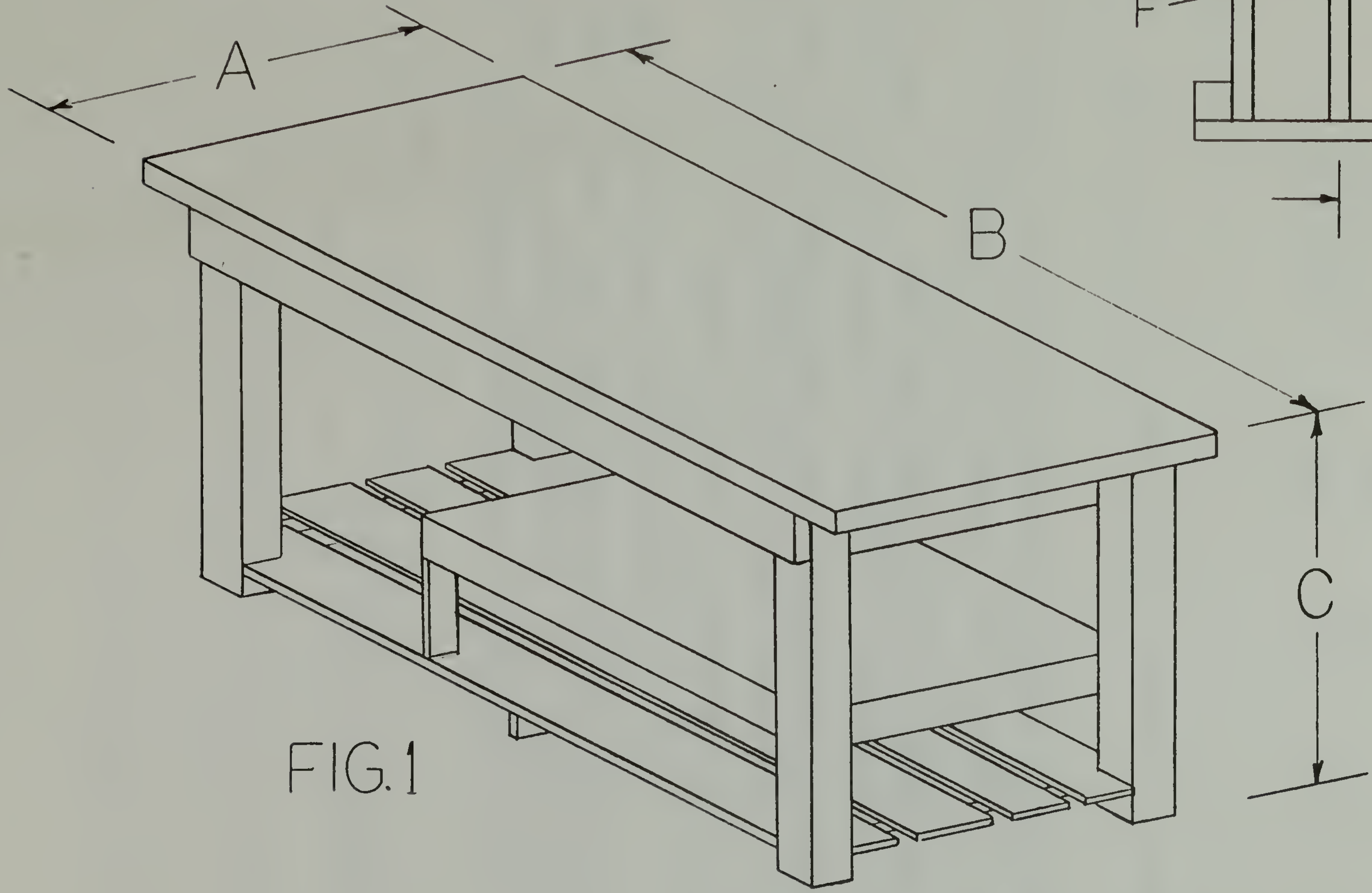


FIG.1

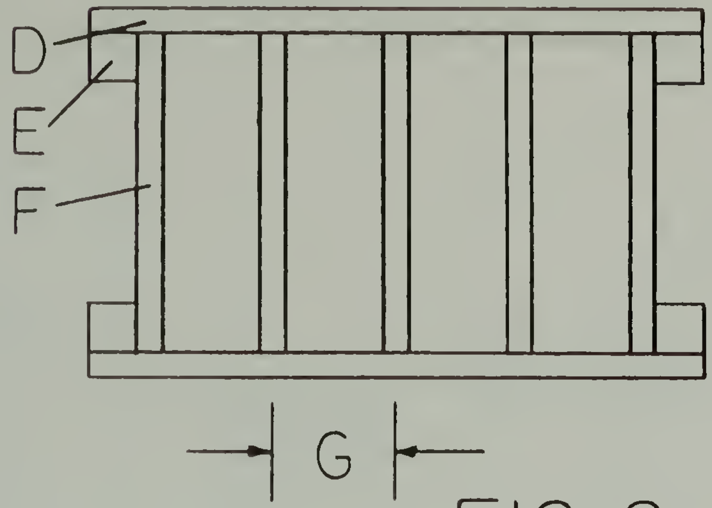


FIG. 2

Frame: 4" x 4" legs (part E) (e.g., railroad ties) with 2 x 6's (part D) and 2 x 4's (part F) across the top and 2 x 4's (part F) at the bottom. The top 2 x's are flush with the top of the legs and the lower 2 x 4's are attached so as to leave a 1" (minimum) space at the bottom of the legs. Attachment of all 2 x's can be done with nails (e.g., 12p to 20p) or lag screws (3 1/2" minimum). Upper frame requires several 2 x 4 crosspieces (maximum of 16" on center - see Fig. 2, G) nailed or screwed, top edges flush, through the 2 x 6 sides.

Top: Pressed wood (e.g., Masonite) secured to an underlayer of 3/4" A/C plywood using brads (e.g., 18 gauge; 3/4" length). Do not adhere the pressed wood to the underlayer, as replacement may be necessary at some time. Secure the underlayer to the 2 x 6 and 2 x 4 frame (parts D and F) with nails (e.g., 12p to 20p) or wood screws (e.g., 2" or longer)

Bottom shelf: Pine shelving or strapping is nailed (4p) to the 2 x 4's. A '3rd leg' brace (3/4" pine) is nailed at the midpoint of the floor span (maximum 36" span).

Second shelf (optional): Dimensions can vary according to needs. Essentially, it is a 2 x 4 or 1 x 3 frame attached, on one end, to one pair of bench legs and supported at the opposite end with two 1 x 3 legs nailed (from below) to the bottom shelf. Surface can be solid (recommended), using 1/4" to 3/8" plywood, or pieced, using shelving or strapping.

Tables H--: HARDWARE

The following tables list the types and sizes of hardware which are used most frequently in providing adaptive services. The quantities given are suggested 'start-up' quantities. The specific values also indicate the most frequently used sizes.

Some tables also have sizes listed, but no quantities are given. These are shown, however, as they may be used at some time, but so rarely that it is not really advisable to keep them in stock.

TABLE HMS: SCREWS - MACHINE (BOLTS)

			LENGTHS									
TYPE	SIZE	THREAD	3/8	1/2	5/8	3/4	1	1.25	1.5	1.75	2	2.5
Machine screw, round head	6	32		a		a	a					
	8	32		a		a	a					
	10	32		2a		2a	a	a	a	s	p	
	1/4	20				a	a	2a	a	s	s	p
	5/16	18									p	
Machine screw, flat head	6	32										
	8	32		a		a	a					
	10	32		2a		2a	2a	2a	s			
	1/4	20				s	a	a	s	s	s	p
	5/16	18									p	
Machine screw, Allen head	6	32							a			
	8	32					a					
	10	32						a	a			
	1/4	20						a	a			
	5/16	18							a			
Machine screw, pan head	1/4	20		a								

Notes: a = 25, 2a = 50; s = less than 25; p = optional

TABLE HWS/SMS: SCREWS - WOOD & SHEET METAL TYPES

			LENGTHS									
TYPE	SIZE	THREAD	3/8	1/2	5/8	3/4	1	1.25	1.5	1.75	2	2.5
Wood screw, flat and round head, steel	6	-		s		2a	2a					
	8	-			o	a	2a	2a	s			
	10	-				a	2a	a	a	o	a	
	12	-					o		o		o	o
Wood screw, flat head, brass	4	-			a							
Sheet metal, pan head	6	-	2a	2a		2a	a					
	8	-	a	a		2a	2a	s				
	10	-				2a	s		s			
	12	-					s		s			
	14	-					s					
Sheet metal, washer head	8	-		2a		2a						
	10	-		2a		2a						
Sheet metal, oval head	8	-				2a						

Notes: a = 25, 2a = 50; s = less than 25; p = optional

TABLE HWS/SMS: SCREWS - WOOD & SHEET METAL TYPES

			LENGTHS									
TYPE	SIZE	THREAD	3/8	1/2	5/8	3/4	1	1.25	1.5	1.75	2	2.5
Wood screw, flat and round head, steel	6	-		s		2a	2a					
	8	-			p	a	2a	2a	s			
	10	-				a	2a	a	a	p	a	
	12	-					p		p		p	p
Wood screw, flat head, brass	4	-			a							
Sheet metal, pan head	6	-	2a	2a		2a	a					
	8	-	a	a		2a	2a	s				
	10	-				2a	s		s			
	12	-					s		s			
	14	-					s					
Sheet metal, washer head	8	-		2a		2a						
	10	-		2a		2a						
Sheet metal, oval head	8	-				2a						

Notes: a = 25, 2a = 50; s = less than 25; p = optional

TABLE HMSN: MACHINE SCREW NUTS

SIZE	THREAD	HEX	LOCK	WING	TEE	ACORN
6	32	s	s		s	
8	32	a	a	a	a	
10	32	2a	2a	a	2a	s
1/4	20	2a	a	a	2a	s
1/4	28	p	p			
5/16	18	a	s	s	a	
3/8	16	a	s		a	
1/2	20	p				

Notes: a = 25, 2a = 50; s = less than 25; p = optional

COMMENTS: Nuts should be plated so as to reduce rust and corrosion. A better material to use would be stainless steel, but these are more expensive. Another method of classification by threads is UNC and UNF. For example, the #6, 8, and 10 nuts with 32 threads (per inch), the 1/4 with 28 and the 1/2 with 20 are UNF. The remainder are UNC.

TABLE HW: WASHERS

		1"	1.25"	1.5"		
SIZE	FLAT	FENDER	FENDER	FENDER	LOCK	FINISH
6	s				s	a
8	a				s	a
10	p				p	2a
12	p					a
3/16	2a				a	s
1/4	2a	a	a	p	a	s
5/16	s		a	p	a	
3/8	s		p	p	s	

Notes: a = 25, 2a = 50; s = less than 25; p = optional

COMMENTS: As in the case of steel nuts and bolts, washers should also be plated to reduce corrosion. See also 'Notes' below "NUTS" table.

TABLE HM: MISCELLANEOUS

ITEM	SIZE	AMOUNT
Coupling nut	1/4 - 20 by 7/8"	optional
Threaded insert	10 - 32	25[1]
Hex headed bolts	Varies	See below[2]
Rivets, steel	1/8" & 3/16"	See below[3]
Rivets, aluminum	As above	See below[3]

COMMENTS:

1. Threaded inserts have many uses. This type of hardware is often called by a trade name, "Helicoil" for example.

2. Hex head bolts are typically stronger than a machine screw. Their use is recommended where strength is a major concern. It is best to purchase them on an as-needed basis. See also 'Notes' below "NUTS" chart.

3. Rivets come in different head styles, most commonly Button and Flange. They also come in different 'grip ranges'. Use .065-.125 and .188-.250 for most applications.

The table below lists the types, configurations, and dimensions of metal stock which we have found to be important in providing adaptive services. The 'Quantity' column gives some indication of the frequency of need for each particular stock item. Our suppliers are listed in the "Suppliers" section of this manual.

TABLE MM: METALS

DESCRIPTION	SIZE	QUANTITY[a]
Aluminum angle	1" x 1" x 3/16"	25 feet
	1.5" x 1.5" x 3/16"	25 feet
Steel angle, hot rolled	1" x 1" x 1/8"	20 feet
Aluminum barstock	1" x 3/16"	16 feet
Steel barstock, hot-rolled	1" x 3/16"	20 feet
	1" x 1/8"	20 feet
	1.5" x 1/8"	20 feet
Steel square tubing	1" O. D.	10 feet
	3/4" O. D.	10 feet
Aluminum rod	3/4"	12 feet
	1/2"	12 feet
Steel rod	1/2"	20 feet

a: These quantities are suggested 'start-up' amounts.

The table below lists the various materials we use in providing adaptive services that come in sheet form. The quantities provided under the "Thickness" column are suggested ′start-up′ quantities and provide some indication of the use of each material relative to its thickness.

TABLE MS: PLASTICS, WOODS, FOAMS & TRIWALL

MATERIAL	SHEET SIZE	COLOR	THICKNESSES 1/8"	 1/4"	 3/8" (9mm)	 1/2" (12mm)	 3/4"
′HDSR′ Polyethylene	4′ x 8′	white	1	1	2	1	-
′HDSR′ Polyethylene	4′ x 8′	black	-	-	1	1	-
A B S Plastic	4′ x 8′	white	1	-	-	-	-
A B S Plastic	4′ x 8′	black	1	-	-	-	-
Acrylic Plastic	4′ x 8′	clear	1	1	-	-	-
Plywoods:							
Baltic Birch; ′BB′	5′ x 5′	-	p	1	2	2	1
A C Sanded Fir	4′ x 8′	-	-	-	1	1	o
Luan	4′ x 8′	-	-	1	-	-	-

			1/4"	3/4"	1"	2"	-
Maple or Hardwood	varies		-	5′	-	-	-
Ethafoam Equivalent	24" x 96"	(typ)	5	-	2	1	-
Polyurethane Foam ′1844′	54" x 78"	(typ)	-	-	1	1	-
Triwall Cardboard	61" x 178"	(typ)	-	5	-	-	-

- -

Plastic laminate (′Formica′) purchase several colors/patterns

- -

Notes:
HDSR = High Density Stress Relieved
BB = Grade of plywood, with knots showing on both sides
1844 = Poly foam designation, where "18" represents a 1.8 pound density and "44" represents the index of deflection
p = optional
- = not necessary

SUPPLIERS

The following is a listing of the major suppliers that we have used in obtaining supplies over the past few years. They are listed alphabetically by the first letter of the name of the company. The "Comments" section provides both an indication of what kinds of supplies they provide as well as some further information about the company.

Abbeon Cal, Inc.
123-208A Gray Ave.
Santa Barbara, CA 93101

Supplies: Tools, supplies, adhesives, gadgetry
Comments: Worth browsing through catalog

Alimed, Inc.
297 High Street
Dedham, MA 02026
(617) 329-1560

Supplies: 'O.T.' supplies, foams

Allied Electronics
25 Lowell Street
Wilmington, MA 01887
(617) 942-0150

Supplies: Electronics

Allied Plywood
60 Shipyard Street
Providence, RI 02905
800-255-4337

Supplies: Hard and soft plywood

American Cord & Webbing
505 Eighth Avenue
New York, NY 10015

Supplies: Webbing; buckles

Barrow Fabrics, Inc.
5 Dan Road
Canton, MA 02021
(617) 828-6750

Supplies: Vinyls, upholstery fabrics
Comments: Wide range of colors and characteristics

Bob Cooke's, Inc.
1100 W. Chestnut Street
Brockton, MA 02402
(617) 583-2046

Supplies: Formica; tools; supplies

Brodhead Garrett Co.
4560 E. 71st Street
Cleveland, OH 44105
800-321-6730

Supplies: Tools, supplies
Comments: Worth browsing through catalog

Brooks Precision
10 Green Street
Woburn, MA 01801
(617) 935-9690

Supplies: Knob kits; supplies

Burns, Inc.
350 M. S. Bishop Blvd.
Fall River, MA 02721
800-341-2200

Supplies: Industrial tools; supplies
Comments: Also specialized equipment

Carr Lane Mfg. Co.
590 Hillside Avenue
P. O. Box 307
Needham Hts., MA 02194

Supplies: Prong Knobs; jigs/fixtures
Comments: Worth browsing through catalog

Chromate Industrial Corp.
c/o Anthony Thomas
53 Brandeis Circle
Halifax, MA 02338
Home: (617) 293-3995

Supplies: Fasteners; supplies
Comments: Industrial quality

Continuing Care Associates
611 B Neponset Street
Canton, MA 02021
(MA) 800-322-0403

Supplies: Wheelchair apparatus; Postura clips

Corro-Fab Mfg.
60-T Maple Street
Mansfield, MA 02048
(617) 339-6321

Supplies: Triwall cardboard

Edmund Scientific
101 E. Gloucester Pike
Barrington, NJ 08007

Supplies: Tools, supplies
Comments: worth browsing through catalog

Fred Sammons, Inc.
Box 32
Brookfield, IL 60513-0032
800-323-7305

Supplies: 'O.T.' supplies

H & R Corporation
401 E. Erie Ave
Philadelphia, PA 19134

Supplies: Electronics; gadgetry
Comments: They publish periodic catalogs (save old ones!)

Homa Locks, Inc.
39 Shelter Rock Road
Danbury, CT 06810

Supplies: Fastex buckles

KAR Products
c/o Fred Jensen
495 Boxberry Hill Road
Hatchville, MA 02536
Home: (617) 564-4152

Supplies: Industrial quality fasteners; supplies

Lab Safety Supply
P. O. Box 1368
Janesville, WI 53547-1368

Supplies: Safety equipment

Louis Green
Forbes Industrial Park
P. O. Box 221
Chelsea, MA 02150
(617) 884-6820

Supplies: Webbing; buckles

New Bedford Thread Co.
P. O. Box F 72
New Bedford, MA 02742

Supplies: Sewing supplies

Oui-Lok Corp.
P. O. Box H
Wareham, MA 02571

Supplies: Velcro-type products

Palco Plastics
183 Bedford Street
Whitman, MA 02382
(617) 447-0064

Supplies: Polyethylene & other plastics

Phase One Office Products
89 Fulkerson Street
Cambridge, MA 02141
(617) 547-0700

Supplies: Office products

Pierce Aluminum
Will Drive
Canton, MA 02021
(MA) 800-532-9662

Supplies: Aluminum stock

Radio Shack

Supplies: Electronics

Recreational Equipment, Inc.
P. O. Box C-88125
Seattle, WA 98188-0125

Supplies: Webbing, buckles, specialty items

Turner Steel Co., Inc.
128 N. Main Street
W. Bridgewater, MA 02379
(617) 583-7800

Supplies: Steel stock

W. T. Tool Co., Inc.
1234 Washington Street
Box 481
Stoughton, MA 02072
(MA) 800-242-0943

Supplies: Tools; supplies
Comments: Inexpensive, but be careful

SAMPLE REFERRAL FORMS

The following pages are examples of the referral forms used by the Adaptive Design Services Project. A bit of explanation is in order.

The upper right corner of the forms (except the "Physician's Prescription Form") is reproduced below:

Date submitted:______________________

D.O.L:______________

START Date:__________

S.O. Date:__________

Des:________________

C.O.R.:_____________

For A.D.S. use only

Line by line explanations:

"Date submitted". The date that the referral is received at the Adaptive Design office is inserted here. This date is used to help prioritize the referral.

"D.O.L." (Date on Line) Adaptive Design uses computer software to maintain listings of all referrals, including: past referrals, active referrals and cancelled requests. The database that is used permits the compilation of a range of statistics.

"START Date". This is the date the work on the referral is started, usually the date that the initial fitting is held.

"S.O. (Sign Off) Date". This is the date that the referral is completely done, including a post-fabrication trial period.

"Des." (Designer) This is for the name of the Designer(s) assigned the project.

"C.O.R." (Coordinator of Referral) This is the individual from the school program who initiated the referral. It is filled in when the project is considered complete.

Other information of importance is contained on the form, such as the names, addresses and telephone numbers of the student's parent or guardian and the Coordinator of Referral. For our purposes we also need to know the student's age and school district ('L.E.A.').

Each form also has areas to be filled out which are more or less specific to the type of referral. For example, the Wheelchair Adaptation form includes spaces to list team members who have provided input. The Educational Aid/Special Project form allows a categorization of the nature of the referral so that, in completing the remainder of the form, a context is established and repetition is limited.

Date submitted: ____

STUDENT EVALUATION FORM

FOR

WHEELCHAIR ADAPTATION

adaptive
design

D.O.L.: ____
START Date: ____
S.O. Date: ____

Des: ____
C.O.R.: ____

For A.D.S. use only

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L.E.A. ____

STUDENT ____ D.O.B. ____

PARENT/GUARDIAN ____ PHONE # ____

ADDRESS ____

____

COORDINATOR OF REFERRAL ____

ADDRESS ____

____ PHONE # ____

RELATIONSHIP TO STUDENT ____

PARTICIPANTS : (signed by those who participated in completing this form; also include title)

____ ____

____ ____

A. BACKGROUND INFORMATION:

1. DIAGNOSIS:

2. RELEVANT MEDICAL INFORMATION (including orthopaedic status and recommendations; respiratory precautions; seizure patterns):

(continued on next page)

3. Current functional skills:

   a. Cognitive abilities and language skills (include method of communication)

   b. Mobility (include gross motor developmental level):

   c. Level of self care:

   d. Level of self feeding:

   e. Vocational and Avocational:

4. Behavioral components:

5. Environmental considerations, transportation considerations, and/or staff concerns or problems:

6. Safety considerations and/or precautions:

B. CURRENT EQUIPMENT:

1. Type of equipment presently used: (include orthotic devices, relevant adapted equipment, current wheelchair, etc.)

2. Functional use: (compensatory behaviors and attitudes, upper extremity use, mobility, etc.)

3. General posture:

4. Loaner wheelchair requirements: (does the student have a second wheelchair to use while modifications are in progress?)

Student's Physician:____________________________

Address: ____

Telephone:____________________________

Date submitted: ____________

STUDENT EVALUATION FORM

FOR

EDUCATIONAL AID/SPECIAL PROJECT

adaptive design

D.O.L.: ____________
START Date: ____________
S.O. Date: ____________

Des: ____________
C.O.R.: ____________

For A.D.S. use only

department of education, bureau of institutional schools

L.E.A. ____________

STUDENT ____________ D.O.B. ____________

PARENT/GUARDIAN ____________ PHONE # ____________

ADDRESS ____________

____

COORDINATOR OF REFERRAL ____________

ADDRESS ____________

____________ PHONE # ____________

RELATIONSHIP TO STUDENT ____________

A. Client need (check one category)

1. ___Positioning & Mobility
2. ___Education/ADL
3. ___Non-verbal communication
4. ___Other

B. Describe requested educational aid/special project:

C. Objectives of adaptation/functional goal(s):

D. Medical/safety considerations (include diagnosis):

E. What modifications have been tried?:

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Date submitted: ____________

STUDENT EVALUATION FORM

FOR

ACTIVE STIMULATION
PROGRAMMING DEVICE

adaptive
design

department of education, bureau of institutional schools

D.O.L.: ____________
START Date: ____________
S.O. Date: ____________

Des: ____________
C.O.R.: ____________

For A.D.S. use only

L.E.A. ____________________

STUDENT ____________________ D.O.B. ____________

PARENT/GUARDIAN ____________________ PHONE # ____________

ADDRESS ____________________

____

COORDINATOR OF REFERRAL ____________________

ADDRESS ____________________

____________________ PHONE # ____________

RELATIONSHIP TO STUDENT ____________________

A. What is the goal of the device?

B. What is the student objective?

C. Physical status: What movements are functional?

Which movements are being encouraged?

D. Behavior: What are you trying to encourage or discourage?

E. Reinforcers to be used (i.e., radio, toy, etc.)

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ADAPTIVE EQUIPMENT

REPAIR FORM

adaptive
design

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Date submitted:____________________

D.O.L.:____________
START Date:____________
S.O. Date:____________

Des:____________
C.O.R.:____________

For A.D.S. use only

L.E.A. ______________________________

STUDENT ______________________________ D.O.B. ____________________

PARENT/GUARDIAN _________________________ PHONE # ____________________

ADDRESS ______________________________

____

COORDINATOR OF REFERRAL ______________________________

ADDRESS ____

______________________________ PHONE # ____________________

RELATIONSHIP TO STUDENT ______________________________

A. Type of device: ______________________________

B. Request for repair(s): (please explain each as needed)

1.

2.

3.

** Repairs to commercially available equipment should be taken care of by the appropriate vendor **

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